Yellow Lake Fishery Survey, Burnett County, Wisconsin

2014

WBIC Yellow Lake – 2675200

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Northern Region – Spooner

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Executive Summary

A comprehensive survey of Yellow Lake, Burnett County, was conducted during the 2014 sampling season by the Wisconsin Department of Natural Resources (DNR). The primary objective of this study was to assess the status of the walleye population. Secondary objectives were to assess the bass and panfish populations.

The 2014 adult walleye population was estimated at 6,987 fish. This estimate is lower than the previous population estimate in 2008 (10,464 fish) and second lowest in previous WDNR surveys. The density (3.1 fish/acre) was above the average density of other Ceded Territory walleye lakes where natural reproduction was the primary source of recruitment (2.7 fish/acre).

A total of 41 largemouth bass were collected ranging from 9.0 to 17.0 in. Largemouth bass sampled averaged 14.2 in (S.D. = 2.2). Bluegill (44%) and yellow perch (38%) were the most abundant panfish collected. Black crappie and rock bass were less abundant.

Management recommendations include: 1) Continue to monitor the walleye population and effects of regulation change. 2) Monitor the largemouth bass population and the response of bluegill populations to no minimum size limit on largemouth bass. 3.) Evaluate both northern pike and muskellunge population status during the next general survey. 4.) Protection and development of shoreline habitat should be promoted in Yellow River and Yellow Lake. 5.) Future efforts to monitor the cisco population should be considered by both fisheries research and management. 6) Prevention and monitoring of invasive species should continue in the lake and at access points. Establishment of future invasive species could be detrimental to this unique system.

Introduction

Yellow Lake is a 2,287 acre drainage lake in the St. Croix River basin in Northwestern Wisconsin. It is fed by the Yellow River from the Southeast and immediately downstream is Little Yellow Lake (348 acres). Yellow Lake has a maximum depth of 31 feet and mean depth of 19 feet. Fish can move freely between Little Yellow Lake and Yellow Lake.

Yellow Lake is considered a eutrophic, polymictic lake. Trophic state index (TSI) is an index for evaluating the trophic state or nutrient condition of lakes (Carlson 1977; Lillie et. al 1993). TSI values can be computed using water clarity (secchi disk measurements), chlorophyll-a, and total phosphorus concentrations. The data on Yellow Lake (WDNR (online) 2014) indicate a eutrophic (high productivity) status when considering TSI values. Between 1992 and 2014, mean secchi TSI measurements were 55.6 (SD = 2.4) from samples taken near the center of Yellow Lake.

There is a wide variety of gamefish, panfish, and non-game fish present in Yellow Lake. Gamefish present in the lake include: walleye *Sander vitreus*, muskellunge *Esox masquinongy*, lake sturgeon *Acipenser fulvescens,* northern pike *Esox lucius*, smallmouth bass *Micropterus dolomieu,* and largemouth bass *Micropterus salmoides*. Common panfish in the lake include: bluegill *Lepomis macrochirus*, pumpkinseed *Lepomis gibbosus*, black crappie *Pomoxis nigromaculatus*, and yellow perch *Perca flavescens*. Non-game fish species common in Yellow Lake include: bowfin *Amia calva*, bullhead catfishes *Ameiurus* spp., cisco *Coregonus artedii*, common carp *Cyprinus carpio*, various redhorse species *Moxostoma* spp., and white sucker *Catostomus commersoni.* In addition to common carp, aquatic invasive species present in Yellow Lake include rusty crayfish *Orconectes rusticus* and curlyleaf pond weed *Potamogeton crispus*.

Muskellunge, walleye, and lake sturgeon have been the only species stocked in Yellow Lake since 1974 (Appendix Table 1). Walleye stocking was discontinued due to sufficient

natural reproduction in the system since 2005. Lake sturgeon were stocked twice in the system: once in the lake in 1995 and once in the Yellow River (upstream of the lake) in 2003. Currently, muskellunge are the only fish species stocked in Yellow Lake. Large fingerling muskellunge (10 – 12 in) have been stocked biennially in the fall since 1997. They are stocked at a rate ranging from 0.5 to 1.0 fish/acre.

Other fish management activities conducted by the Wisconsin DNR have included fisheries surveys, targeted lake sturgeon monitoring and propagation (Yellow River), and fall walleye recruitment surveys. The Great Lakes Indian Fish and Wildlife Commission have also conducted population estimates (1996, 1997) and numerous fall walleye recruitment surveys.

The primary objective of this survey was to assess the walleye population. Secondary objectives were to assess largemouth bass, smallmouth bass, and panfish. Muskellunge, northern pike, and lake sturgeon data were not collected as part of this survey.

Methods

Field Sampling

Spring sampling started in late April following the Wisconsin DNR lake sampling protocol (Simonson et al. 2008). Walleye were collected in the Yellow River (upstream of Yellow Lake) during the daytime with a pulsed direct current (DC) electrofishing boat. Sampling started once water temperatures were at/above 45° F. Walleye were collected between Conner's bridge and the Yellow River outlet into Yellow Lake. Sampling occurred from 22 April to 26 April. Adult walleye were marked each sampling day to increase the number-at-large for a population estimate. A recapture electrofishing run took place 27 April which ended river sampling.

Lake sampling consisted of fyke-netting followed by a recapture electrofishing run. After ice out, fyke nets (4 x 6 ft frame) were set on 30 April. Nets were placed on the western shore of Yellow Lake in areas thought to hold large concentrations of spawning walleye. These nets were fished until 5 May for a total of 24 net nights. During this time, additional adult walleye were marked with fin clips before another electrofishing recapture run occurred on 5 May. Specific walleye marking information is included in Appendix Table 2.

Late spring electrofishing took place 3 June. Three two-mile gamefish stations were sampled with a focus on collecting both bass species. Each two mile station had a ½ mile index station embedded within it where panfish were collected in addition to gamefish.

Fall electrofishing took place 29 September to assess natural recruitment of walleye in Yellow Lake. This sampling took place once surface water temperature dropped below 70° F. Walleye less than 12.0 in were collected in the sample.

Age and Statistical Analysis

All walleye, largemouth bass, and smallmouth bass were measured to the nearest half inch. Age structures were collected from walleye and largemouth bass. Scale samples were taken on walleye less than 15 in and bass less than 12 in. Dorsal spines were taken on all larger walleye and bass sampled. Fish were aged to the outside edge of the structure. Panfish (bluegill, black crappie, yellow perch, and rock bass) were measured to the nearest tenth of an inch.

Size structure quality of species sampled was determined using the indices proportional (PSD) stock densities (Neumann et al. 2013). The PSD value for a species is the number of fish of a specified length and longer divided by the number of fish of stock length or longer, the result multiplied by 100 (Appendix Table 3). Catch per effort (CPE) was calculated as the number of fish captured divided by the appropriate unit of sampling effort for that species. The

descending limb of a catch curve regression was used to estimate total annual mortality for walleye (Ricker 1975). The von Bertalanffy growth function (Quist et al. 2013) was used to assess changes in growth between surveys for largemouth. The walleye population was estimated using the Chapman modification of the Peterson estimator and marked adult walleye were used from both river and lake sampling (Pine et. al 2013).

RESULTS

Early Spring Fyke-Netting and Electrofishing

Walleye. The 2014 adult walleye population estimate was 6,987 fish (C.V. = 0.09). This estimate is lower than the previous population estimate in 2008 (10,464 fish) and second lowest in previous surveys (Table 1). The density (3.1 fish/acre) was above the Ceded Territory average density for lakes where natural reproduction was the primary source of recruitment (2.7 fish/acre) (Cichosz 2014). The CPE was 7.1 fish/mile for electrofishing and 4.8 fish/net night for fyke-net sampling.

Adult walleyes captured during the 2014 spring sampling season ranged from 11.7 to 28.2 in (Figure 1). Mean lengths of male and female walleye were 16.0 in (S.D. = 1.5) and 20.3 in (S.D. = 3.0), respectively. The proportional size structure was smaller when compared to previous surveys (Figure 2). PSD was 76 and PSD-20 was 4 for walleye collected in spring 2014, which is lower than the previous three surveys (Table 2).

The growth potential of both male and female walleye has decreased since 2008 (Table 3). Mean length-at-age for male walleye was comparable to the previous three DNR surveys and the Northern Region average (Figure 3). Female walleye mean length-at-age was greater than

previous surveys and up to 2.0 in greater than the Northern Region average (Figure 4). The walleye survival rate was lower in 2014 than 2008 at 57% (Figure 5; Table 4).

Late Spring Electrofishing

Largemouth and Smallmouth Bass. A total of 41 largemouth bass were collected ranging from 9.0 to 17.0 in. Largemouth bass sampled averaged 14.2 in (S.D. = 2.2). The CPE was 5.2 fish/mile, which is lower than the 2008 catch rate (12.7 fish/mile). PSD was not calculated for largemouth bass due to the low sample size. Proportionally, there were greater numbers of fish over 13 inches collected in 2014 than 2008 (Figure 6). One smallmouth bass was captured in 2014 measuring 12.0 in. The 2008 survey had seven smallmouth bass averaging 11.3 in (S.D. = 1.3).

Largemouth bass mean length-at-age stayed similar between the 2008 and 2014 survey. Both surveys were above the Northern Region average until age-8 or 17 in (Figure 7). Largemouth bass growth potential increased in 2014 and had a greater maximum theoretical length than fish sampled in 2008 (Figure 8).

Panfish. Bluegill (44%) and yellow perch (38%) were the most abundant panfish collected (Figure 9). A total of 78 bluegills were collected on 3 June ranging from 3.6 to 9.0 in. Bluegill sampled averaged 7.1 in (S.D. = 1.4). The CPE was 52.0 fish/mile which is greater than the 2008 catch of 30.0 fish/mile. Sixty-seven yellow perch (2.5 – 10.1 in) were captured at a catch rate of 44.6 fish/mile. Yellow perch sampled averaged 5.7 in (S.D. = 1.7). PSD was not calculated for bluegill or yellow perch due to low sample size. Black crappie and rock bass were not common.

Common carp. One common carp was observed during late-spring electrofishing. This observation makes the third DNR survey where they have been observed in Yellow Lake since 1968.

Fall Electrofishing

The catch rate of Young of Year (YOY) walleye was below the Ceded Territory average (18.2 fish/mile) at 4.2 fish/mile (Figure 10). This catch rate is slightly lower than the long term average of 6.6 fish/mile. The catch rate of 1.1 fish/mile for age-1 walleye was below the Ceded territory average of 2.6 fish/mile (S.D. = 4.7).

DISCUSSION

Yellow Lake remains a stable fishery for walleye, largemouth bass, and panfish. The riverine spawning habitat, eutrophic/turbid water, and abundant prey resources have helped the walleye population stay resilient to change when many lakes in the area have undergone severe declines over the last 30 years (Wendel 2011; 2013). Largemouth bass and other centrarchids have not become the dominant fishes in Yellow Lake as seen in other lakes in Northwest Wisconsin (Toshner 2009). Instead, the fishery still holds a healthy walleye population and has a good prey base.

The walleye population density and size structure did decrease, while annual mortality increased since 2008. However, this was not the lowest population level that has been recorded for Yellow Lake (GLIFWC 1997-2.1/acre). The lower proportion of fish greater than 15 inches is concerning. The new harvest regulation (15 in minimum, 20 – 24 in protected, and one fish over 24 in size limit) implemented in 2015 should help reduce pressure on larger/female walleye. This reduction in harvest could be up to five percent (WDNR-Treaty unpublished data). This

reduction in harvest is important since 30% of females collected were within this size range in Yellow Lake.

Spawning habitat in the Yellow River is critical for the continued success of natural reproduction of the walleye population. Protection of the rocky substrates and riffle areas are important for the survival of walleye eggs (Bozek et al. 2011) and should be encouraged with riparian land owners in the river. Yellow Lake continues to have below average recruitment for walleye lakes supported by natural reproduction. However, catch of age-1 fish is good at 1.1 fish/mile and young walleye likely survive well past age-1. The abundance of preferable prey items (especially yellow perch) likely bolster survival of young walleye, despite limited natural recruitment (Bozek et al. 2011).

The largemouth bass population appears to have decreased since the previous survey in 2008. This differs from most walleye lakes in the region where increased largemouth bass abundance has been the trend. Largemouth bass growth has improved with an increase in average length and maximum theoretical length since 2008. Smallmouth bass are present in small numbers in Yellow Lake but do not provide a fishery. Smallmouth bass have historically been uncommon in Yellow Lake.

The panfish community in Yellow Lake remains diverse with good numbers of both bluegill and yellow perch present in the sample. Though there has been a reduction in bass catch rates, the bluegill population has not dramatically increased. The diverse piscivore community plays a role in keeping bluegill numbers lower. A good proportion of yellow perch in the 2014 panfish sample is encouraging. Walleye, muskellunge, and northern pike all prefer to prey on yellow perch when available (Bozek et al. 1999; Bozek et al. 2011; Margenau et al. 1998).

Muskellunge and northern pike populations were not assessed but remain an important part of the Yellow Lake fishery. Efforts to collect muskellunge in Yellow Lake resulted in poor catch rates during 2008. Dombeck et al. (1984) mention several studies where muskellunge are using rivers as spawning areas.

The forage base in Yellow Lake plays a major role in supporting a good walleye population. In addition to yellow perch and suckers, cisco is another potentially important prey resource in Yellow Lake. Lyons et al. (2015) found a moderate population of cisco in Yellow Lake based on vertical gill net catches. Ciscoes are an energy rich prey item for the lake's adult walleye and northern pike (Bozek et al. 2011; Jacobson 1992). They persist in the lake despite what is considered poor conditions for cisco survival.

Common carp are present in Yellow Lake but haven't established an abundant population since they were first observed in 1968. The presence of a diverse panfish community, specifically bluegill, helps limit carp recruitment (Bajer and Sorenson 2009). Carp that do survive face potential predation from northern pike, walleye, muskellunge and bass (Bozek et al. 1999; McMahon and Bennett 1996). Additionally, there are good populations of lake sturgeon and suckers in Yellow Lake which have similar benthic diets and possibly compete with carp. Carp and other invasive species present in Yellow Lake appear to be having minimal impacts at this time. The diverse fish community provides a robust buffer to help prevent establishment of invasive species in the lake (Shea and Chesson 2002).

Conclusions and Management Recommendations

1) Walleye are the primary sportfish in Yellow Lake and remain the primary interest of management. Effects of the new 3 bag limit and 15 in minimum, 20 – 24 in protected slot, and

one fish over 24” should be monitored in 2019. If total annual mortality is higher than 60% or size structure and density decreases (<14.0 inch average & 1.5 fish/acre), and poor recruitment continues a more restrictive 18 inch minimum should be considered in 2020.

2.) Largemouth bass size structure has improved since 2008. A no minimum size limit should be continued to allow bass harvest and sustain low catch rates and improved growth. Smallmouth bass remain a low density sportfish in the lake.

3.) Northern pike and muskellunge should be evaluated during the next general survey. River sampling should be used in combination with fyke netting in the lake to assess the muskellunge population. Northern pike should be evaluated using fyke nets in conjunction with spring walleye netting.

4.) Protection and enhancement of shoreline habitat should be promoted in the Yellow River and Yellow Lake. Addition/protection of vegetation and coarse woody debris will help the lake to continue to support a diverse fish community. Protection of the river habitat is critical to maintaining good reproduction of walleye and lake sturgeon.

5.) Future efforts to monitor the cisco population should be considered by both fisheries research and management. This unique prey resource provides a high quality prey item for piscivores in Yellow Lake.

6.) Preventing introductions and monitoring of invasive species should continue in the lake and at access points. Establishment of future invasive species could be detrimental to this unique system.

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Literature Cited

Bajer, P.G., and P.W. Sorensen. 2009. Recruitment and abundance of an invasive fish, the common carp, is driven by its propensity to invade and reproduce in basins that experience winter-time hypoxia in interconnected lakes. Biological Invasions 12:1101-1112.

Bozek, M.A., T.M. Burri, and R.V. Frie. 1999. Diets of muskellunge in Northern Wisconsin Lakes. North American Journal of Fisheries Management. 19:258-270.

Bozek, M.A., T.J. Haxton, and J.K. Raabe. 2011. Walleye and sauger habitat. Pages 133 – 197 *in* B.A. Barton, editor. Biology, management, and culture of walleye and sauger. American Fisheries Society, Bethesda, Maryland.

Carlson, R. 1977. A trophic state index for lakes. Limonology and Oceanography 22:361-369.

Cichosz, T.A. 2014. Wisconsin Department of Natural Resources 2012-2013 Ceded Territory Fishery Assessment Report. Wisconsin Department of Natural Resources. Administrative Report 75, Madison, WI.

Dombeck, M.P., B.W. Menzel, and P.N. Hinz. 1984. Muskellunge spawning habitat and reproductive success. Transactions of the American Fisheries Society 113: 205-216.

Jacobson, P.C. 1992. Analysis of factors affecting growth of northern pike in Minnesota. Investigational Report 424. Minnesota Department of Natural Resources, Minneapolis, MN.

Lillie, R.A., S. Graham, and P. Rasmussen. 1993. Trophic state index equations and regional predictive equations for Wisconsin lakes. Bureau of Research – Wisconsin Department of Natural Resources, Research Management Findings, Number 35.

Lyons, J., J. Kampa, T. Parks, and G. Sass. 2015. The whitefishes of Wisconsin's lakes: The 2011-2014 Wisconsin Department of Natural Resources cisco and lake whitefish survey. Fisheries and Aquatic Research Section. Wisconsin Department of Natural Resources, Madison, Wisconsin.

Margenau, T.L., P.W. Rasmussen, and J.M. Kampa 1998. Factors affecting growth of northern pike in small Northern Wisconsin lakes. North American Journal of Fisheries Management 18: 625-639.

McMahon T.E. and D.H. Bennett. 1996. Walleye and Northern Pike. Fisheries 21:6-13.

Neumann, R. M., C. S. Guy, and D. W. Willis. 2013. Length, weight, and associated indices. Pages 637-676 in A. V. Zale, D. L. Parrish, and T. M. Sutton, editors. Fisheries techniques, 3rd edition. American Fisheries Society, Bethesda, Maryland.

Pine, W.E., J.E. Hightower, L.G. Coggins, M.V. Lauretta, and K.H. Pollock. 2013. Design and analysis of tagging studies. Pages 521-572 in A. V. Zale, D. L. Parrish, and T. M. Sutton, editors. Fisheries techniques, 3rd edition. American Fisheries Society, Bethesda, Maryland.

Quist, M.C., M.A. Pegg, and D.R. DeVries. 2013. Age and growth. Pages 677-731 in A. V. Zale, D. L. Parrish, and T. M. Sutton, editors. Fisheries techniques, 3rd edition. American Fisheries Society, Bethesda, Maryland.

Shea, K. and P. Chesson. 2002. Community ecology theory as a framework for biological invasions. TRENDS in Ecology & Evolution. 17:170 – 176.

Simonson, T., A. Fayram, J. Hennessy, and T. Treska. 2008. Fisheries Assessments - Lakes 2007-09 Sampling Procedures. Wisconsin DNR internal publication. Madison, WI.

Toshner, S. 2009. Fishery Survey – Lake Owen, Bayfield County, 2007-2008, WBIC Code

2900200. Wisconsin Department of Natural Resources, Fisheries Management Report. Brule Field Office.

WDNR (online) 2014. Citizen monitoring lake water quality database. Available from: http://dnr.wi.gov/lakes/CLMN.

Wendel, J. 2011. Yellow and Little Yellow Lakes Fishery Survey, Burnett County, Wisconsin. 2008-2009. MWBIC (Yellow Lake – 2675200, Little Yellow Lake – 2674800). Wisconsin Department of Natural Resources. Fisheries Management Report. Spooner Field Office.

Wendel, J. 2013. Big McKenzie Lake Fishery Survey, Burnett County, Wisconsin, 2012, MWBIC 2706800. Wisconsin Department of Natural Resources, Fisheries Management Report. Spooner Field Office.

Table 1. Walleye population estimates in Yellow Lake, Burnett County, Wisconsin. P.E. = population estimate, C.V. = Coefficient of Variation. * GLIWC estimates using different methods.

	1986	1992	1996*	1997*	2008	2014
P.E.	10,650	9,222	8,348	4,725	10,464	6,987
C.V.	NA	0.07	0.10	0.08	0.07	0.08
fish/acre	4.7	4.0	3.7	2.1	4.6	3.1

Table 2. Walleye PSD and PSD-20 values from fish collected during spring sampling in Yellow Lake, Burnett County, Wisconsin.

Parameter	1986	1992	2008	2014
PSD	90	81	85	75
SD-20	7	6	7	4

Table 3. Adult maximum theorectical length (L∞) and walleye growth rates (k) for male and females based on the von Bertalanffy equaton.

Parameter	1992	2008	2014
L∞ (male)	27.5	22.5	21.7
k (male)	0.12	0.22	0.18
L∞ (female)	23.8	30.8	26.7
k (female)	0.24	0.13	0.28

Table 4. Adult walleye estimated survival rates (S) and correlation strength (R^2) estimates for Yellow Lake, Burnett County, Wisconsin.

Parameter	1986	1992	2008	2014
S	0.57	0.65	0.78	0.57
R^2	0.91	0.70	0.34	0.95

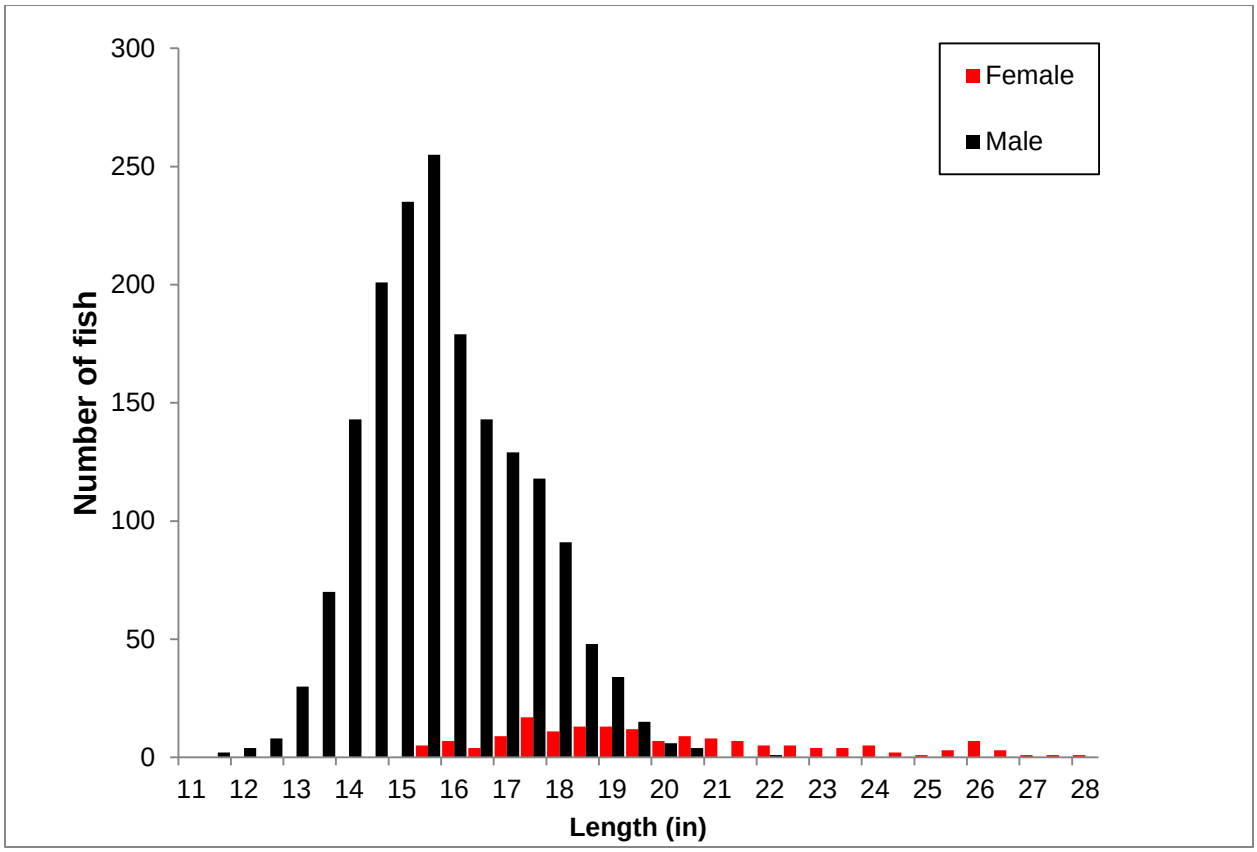

Figure 1. Length frequency of male and female walleye collected in Yellow Lake, Burnett County during spring 2014. Unsexable fish are not included.

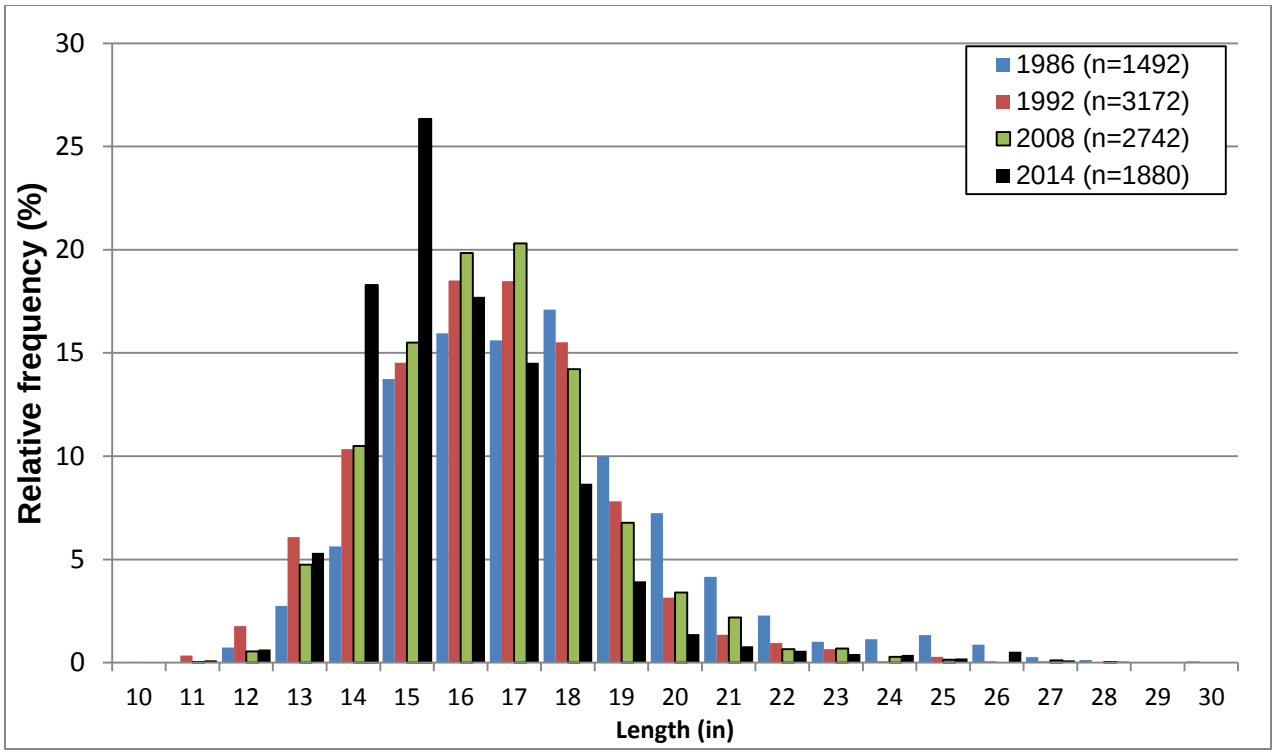

Figure 2. Length frequency of adult walleye captured in Yellow River/Yellow Lake in 1986, 1992, 2008, and 2014.

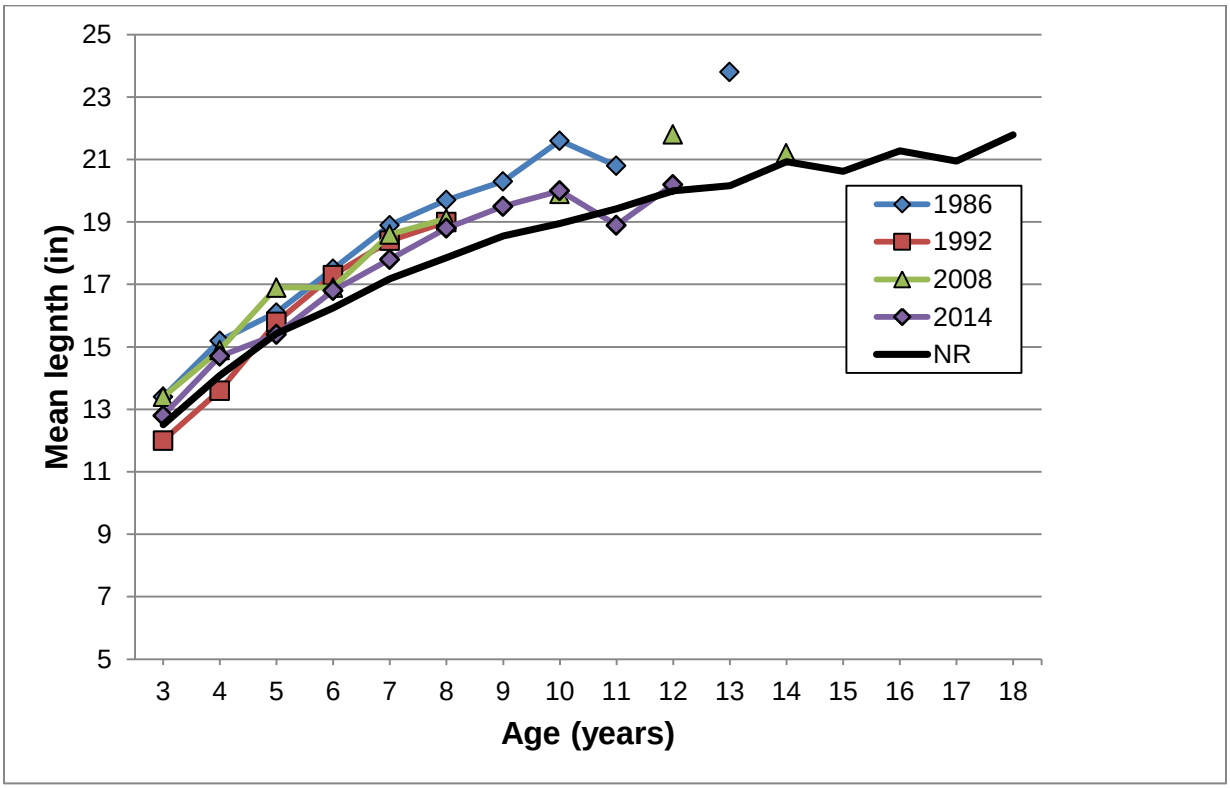

Figure 3. Mean length at age for male walleye captured in Yellow Lake, Burnett County in 1986, 1992, 2008, and 2014. The black line (NR) represents the Northern Region average.

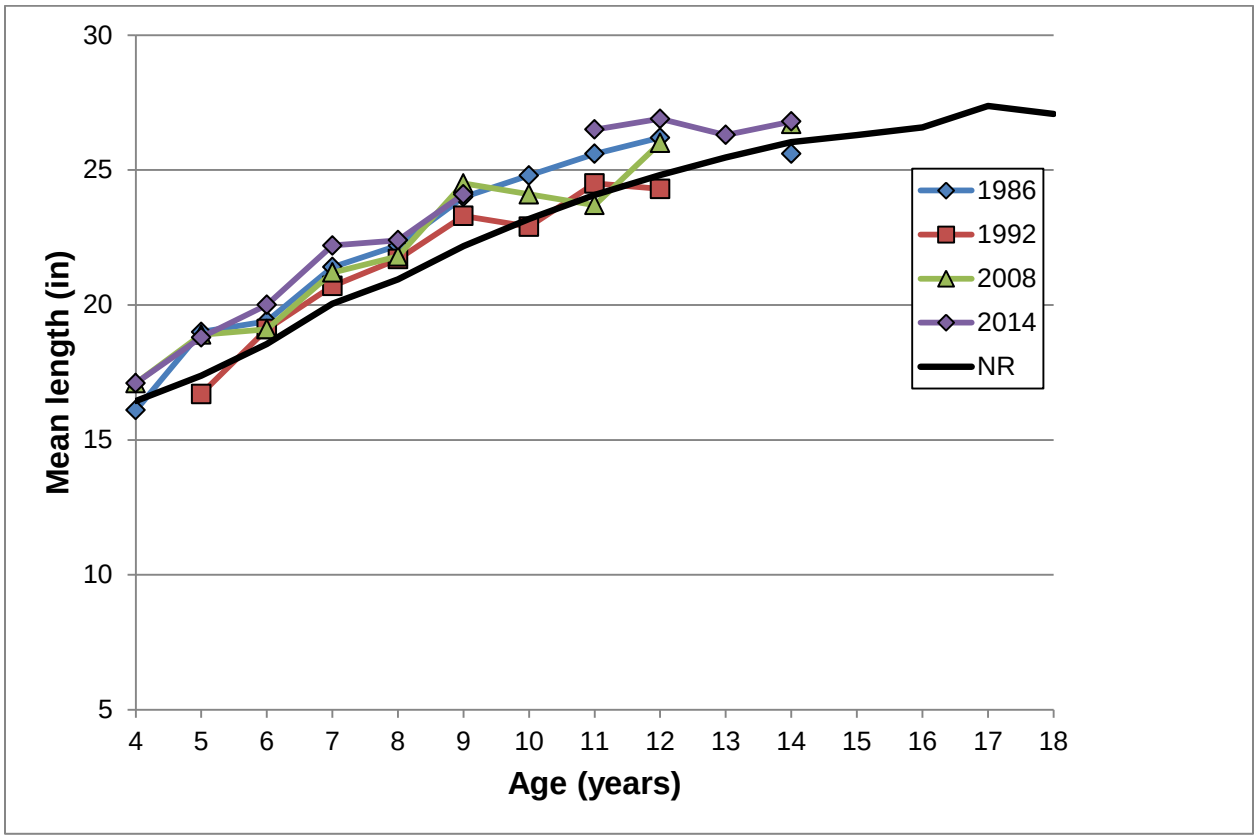

Figure 4. Mean length at age for female walleye captured in Yellow Lake, Burnett County in 1986, 1992, 2008, and 2014. The black line (NR) represents the Northern Region average.

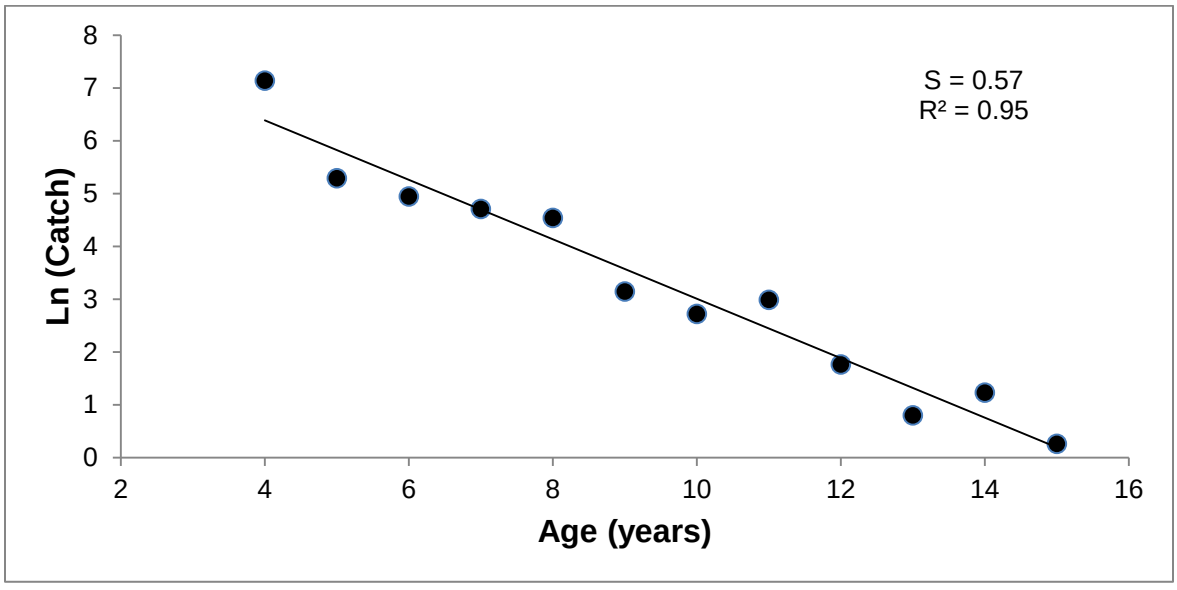

Figure 5. Total annual survival rate for adult walleye captured on Yellow Lake, Burnett County, Wisconsin in 2014.

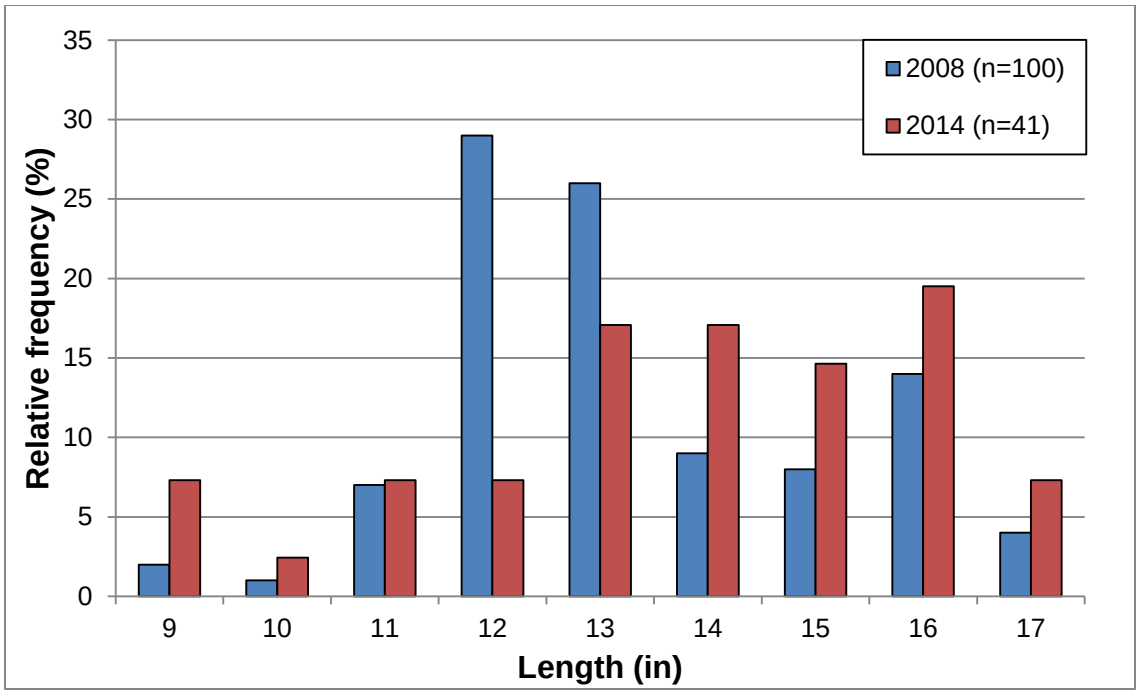

Figure 6. Relative frequency of largemouth bass collected during late-spring electrofishing on Yellow Lake, Burnett County, Wisconsin.

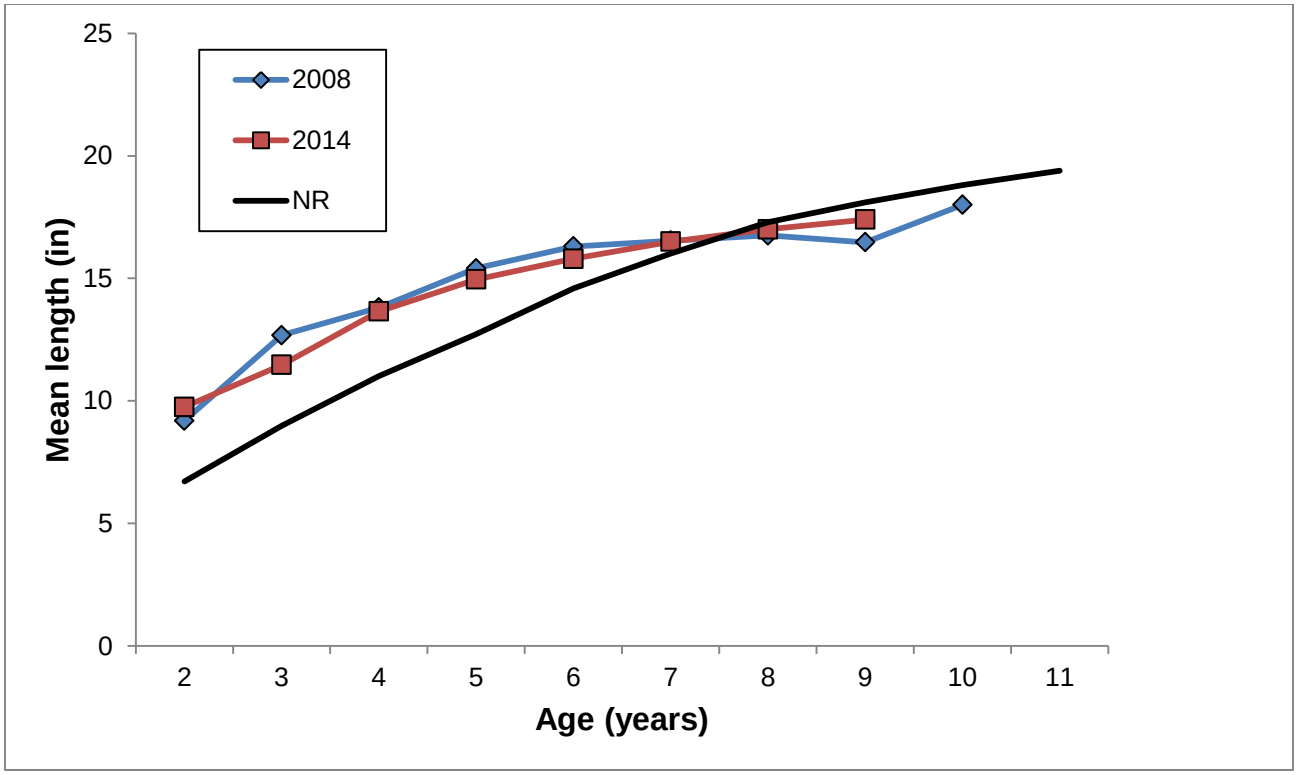

Figure 7. Mean lengths at age for largemouth bass captured during the spring survey on Yellow Lake, Burnett County, Wisconsin. The black line (NR) represents the Northern Region average.

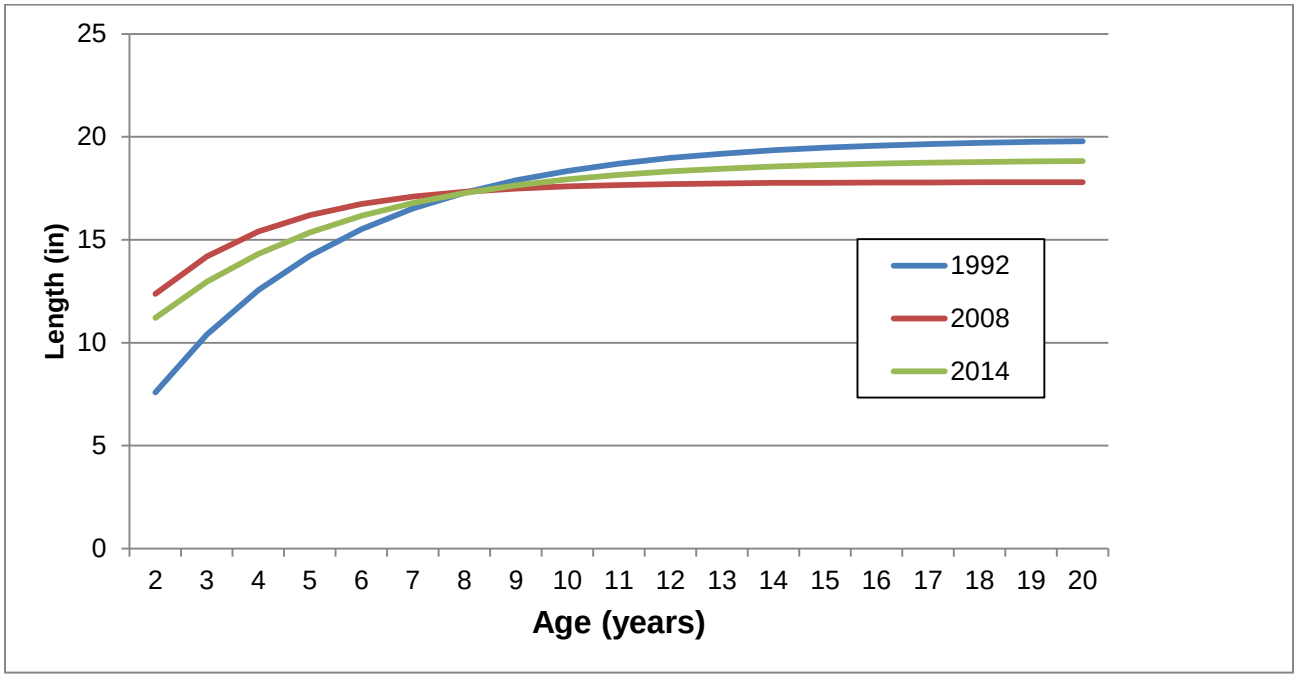

Figure 8. von Bertalanffy growth curves for largemouth bass captured during spring surveys in Yellow Lake, Burnett County, Wisconsin.

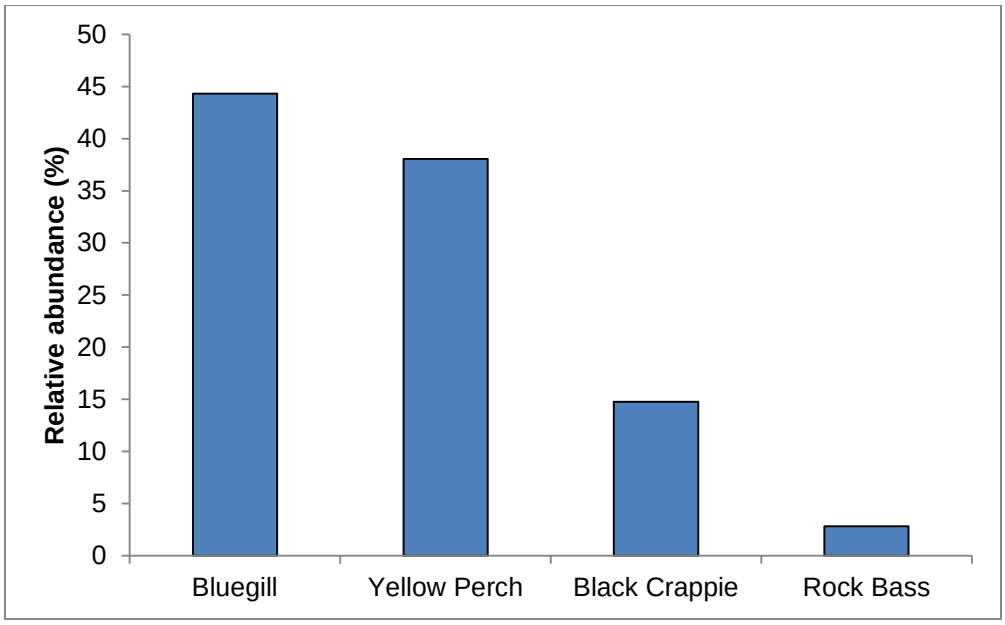

Figure 9. Relative abundance of panfish collected during 2014 late spring electrofishing on Yellow Lake, Burnett County, Wisconsin.

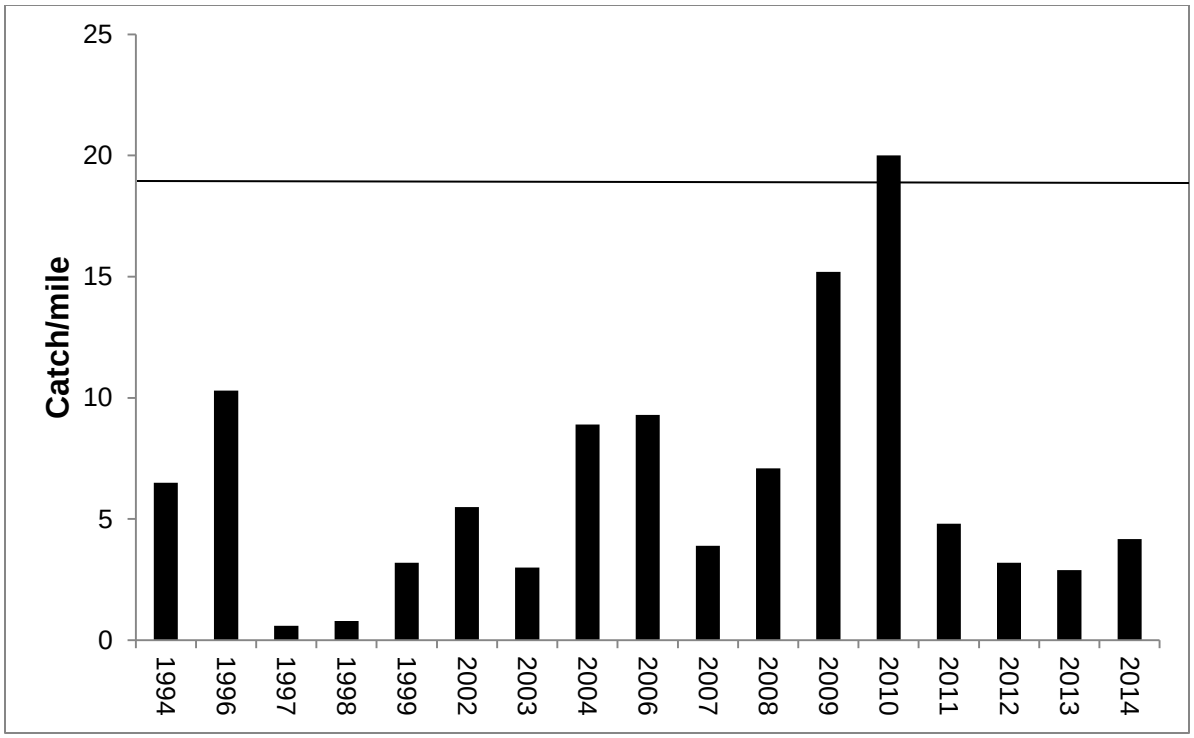

Figure 10. Young of year (YOY) walleye relative abundance determined by fall electrofishing surveys on Yellow Lake, Burnett County, Wisconsin. No surveys took place in 2000, 2001, and 2005. The horizontal black line represents 2012 Ceded Territory average (18.7/mile) for lakes with natural reproduction.

Appendix Table 1. Fish stocking records for Yellow Lake, Burnett County, Wisconsin since 1974.

Year	Species	Age Class	Number Fish Stocked	Avg. Fish Length (IN)
1974	WALLEYE	FINGERLING	41,508	4.2
1976	MUSKELLUNGE	FINGERLING	3,770	9.7
1977	MUSKELLUNGE	FINGERLING	2,000	3
1977	MUSKELLUNGE	FINGERLING	1,287	12.3
1978	MUSKELLUNGE	FINGERLING	1,000	13
1979	MUSKELLUNGE	FINGERLING	3,365	8.3
1980	MUSKELLUNGE	FINGERLING	1,018	11
1981	MUSKELLUNGE	FINGERLING	580	10
1982	MUSKELLUNGE	FINGERLING	1,282	9
1982	WALLEYE	FINGERLING	49,050	3
1982	WALLEYE	FRY	500,000	-
1983	MUSKELLUNGE	FINGERLING	2321	9.7
1983	WALLEYE	FRY	1,024,000	1
1984	MUSKELLUNGE	FINGERLING	2,300	11.8
1985	MUSKELLUNGE	FINGERLING	2,500	10
1986	MUSKELLUNGE	FINGERLING	2,300	7
1986	WALLEYE	FINGERLING	80,460	3
1986	WALLEYE	FRY	500,000	-
1987	MUSKELLUNGE	FINGERLING	6,900	10
1987	WALLEYE	FINGERLING	144,932	3
1988	MUSKELLUNGE	FINGERLING	2,300	9
1988	WALLEYE	FINGERLING	70,979	3
1988	WALLEYE	FINGERLING	8,840	3
1989	MUSKELLUNGE	FINGERLING	2,300	8.3
1989	WALLEYE	FINGERLING	80,342	3
1990	WALLEYE	FINGERLING	27,608	3.5
1991	MUSKELLUNGE	FINGERLING	3,300	10.7
1991	WALLEYE	FINGERLING	16,368	3.5
1992	MUSKELLUNGE	FRY	20,000	1
1992	WALLEYE	FINGERLING	50,700	3
1992	WALLEYE	FINGERLING	18939	2.5
1992	WALLEYE	FRY	130,000	0
1993	MUSKELLUNGE	FINGERLING	3,558	11.3
1994	WALLEYE	FINGERLING	5,610	3.1
1994	WALLEYE	FINGERLING	50,170	2.9
1995	LAKE STURGEON	FINGERLING	1,000	5.9
1995	MUSKELLUNGE	FINGERLING	2,289	11.6
1996	WALLEYE	FINGERLING	32,775	2.3

Appendix Table 1 continued.

Year	Species	Age Class	Number Fish Stocked	Avg. Fish Length (IN)
1996	WALLEYE	FINGERLING	101,000	1.3
1996	WALLEYE	FINGERLING	14,793	2.4
1997	MUSKELLUNGE	LARGE FINGERLING	4,250	11.3
1998	WALLEYE	SMALL FINGERLING	100,000	1.4
1999	MUSKELLUNGE	LARGE FINGERLING	1,500	11.2
2000	WALLEYE	SMALL FINGERLING	24,345	2.6
2000	WALLEYE	SMALL FINGERLING	100,000	1.5
2002	MUSKELLUNGE	LARGE FINGERLING	1,444	10.6
2002	WALLEYE	SMALL FINGERLING	114,330	1.5
2004	MUSKELLUNGE	LARGE FINGERLING	1,445	10.7
2004	WALLEYE	SMALL FINGERLING	114,565	1.2
2004	WALLEYE	SMALL FINGERLING	67,987	2.9
2006	MUSKELLUNGE	LARGE FINGERLING	801	11.6
2008	MUSKELLUNGE	LARGE FINGERLING	1,444	9.5
2010	MUSKELLUNGE	LARGE FINGERLING	1,392	12.2
2012	MUSKELLUNGE	LARGE FINGERLING	2,287	12.8
2014	MUSKELLUNGE	LARGE FINGERLING	1,143	11.2

Appendix Table 2. Summary of fin clips given to walleye in Yellow River and Yellow Lake. RV = right ventral fin, TC = top caudal fin, and LV = left ventral fin.

Date(s)	Location	Sampling Type	Primary Mark(s)	Secondary Mark(s)
04/22 - 04/26	Yellow River	DC Electrofishing	RV ≥ 15" and sexable	TC < 15" or unknown
4/27	Yellow River	DC Electrofishing	TC ≥ 15" and sexable	TC < 15" or unknown
05/01 - 05/05	Yellow Lake	Fyke Nets	LV ≥ 15" and sexable	TC < 15" or unknown

Appendix Table 3. Values used in proportional stock density calculations.

Fish Species	Stock Size (in)	Quality Size (in)	Preferred Size (in)
Largemouth Bass	8	12	15
Walleye	10	15	20